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Triple Tendon Transfer with Flexor Carpi Radialis in Radial Nerve Palsy

Radyal Sinir Paralizisinde Fleksör Karpi Radialis ile Üçlü Tendon Transferi

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ABSTRACT

Aim: This study aims to evaluate the clinical outcomes of our case series involving finger extension restoration using the flexor carpi radialis (FCR) tendon in patients with radial nerve palsy.

Materials and Methods: We retrospectively evaluated patients who underwent tendon transfers using FCR for radial nerve palsy between January 2016 and December 2021. Nineteen patients (15 males, 4 females) were included. Data on the side of injury, gender, age, etiology, history of nerve repair, and time of admission were recorded. Functional outcomes were assessed by comparing preoperative and postoperative Quick-DASH and Bincaz scores.

Results: Postoperative Quick-DASH scores showed statistically significant improvement ($p<0.001$). The mean functional loss score decreased from 31.82 ± 14.82 preoperatively to 16.03 ± 7.97 postoperatively. Analysis of Bincaz scores using the Wilcoxon signed-rank test also demonstrated significant functional recovery ($p<0.001$).

Conclusion: Tendon transfers remain a reliable strategy for restoring motor function when radial nerve repair is not feasible. While various techniques exist, each presents distinct advantages and disadvantages. Surgeons should adopt a case-specific approach tailored to the patient's occupational and functional requirements.

Keywords: Radial neuropathy, flexor carpi radialis, tendon transfer

ÖZ

Amaç: Bu çalışmanın amacı radyal sinir paralizili hastalarda fleksör karpi radialis (FCR) tendonu kullanılarak parmak ekstansiyonunun yeniden sağlanmasına yönelik olgu serimizin klinik sonuçlarını değerlendirmektir.

Gereç ve Yöntem: Çalışmada, Ocak 2016 ile Aralık 2021 tarihleri arasında kliniğimizde radyal sinir felci nedeniyle FCR kullanılarak yapılan tendon transferlerinin sonuçları değerlendirilmiştir. Çalışmaya 19 hasta (15 erkek, 4 kadın) dahil edilmiştir. Olguların taraf, cinsiyet, yaş, yaralanma etiyolojisi, sinir tamiri yapılıp yapılmadığı ve başvuru zamanı kayıt altına alınmıştır. Fonksiyonel değerlendirme cerrahi öncesi ve sonrası Quick-DASH skoru ve Bincaz skorlarıyla karşılaştırmalı olarak yapılmıştır.

Bulgular: Hastaların Quick-DASH skorlarında, operasyon sonrası istatistiksel olarak ileri düzeyde anlamlı bir iyileşme kaydedilmiştir ($p<0,001$). Preoperatif dönemde $31,82\pm14,82$ olan ortalama fonksiyonel kayıp skoru, postoperatif dönemde $16,03\pm7,97$ seviyesine gerilemiştir. Bincaz skorları Wilcoxon işaretli sıralar testi ile analiz edilmiş ve değişim istatistiksel olarak anlamlı bulunmuştur ($p<0,001$).

Sonuç: Tendon transferleri, özellikle radyal sinir onarımının mümkün olmadığı durumlarda motor fonksiyonun yeniden sağlanması açısından güvenilir bir yöntemdir. Farklı teknikler bulunmakla birlikte her birinin kendine özgü avantaj ve dezavantajları vardır. Cerrahlar, hastaların mesleki ve fonksiyonel gereksinimlerini dikkate alarak olguya özgü bir yaklaşım benimsemelidir.

Anahtar Kelimeler: Radyal sinir paralizisi, fleksör karpi radialis, tendon transferi

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INTRODUCTION

The radial nerve is the most frequently injured nerve in the upper extremity[1] typically resulting from direct trauma rather than indirect mechanisms[2]. Although primary nerve repair remains the gold standard of treatment, successful reinnervation is not always achieved, necessitating palliative reconstructive options. In cases where nerve repair or conservative management fails to restore function, tendon transfer may be considered[1].

Loss of radial nerve function leads to significant grasping impairment due to the loss of wrist extension, finger metacarpophalangeal (MCP) extension, and thumb extension[3]. Although most tendon transfers are performed successfully according to standard protocols, the optimal combination of donor tendons for radial nerve palsy remains a subject of ongoing debate[4].

The flexor carpi radialis (FCR) is primarily used for finger extension[5], though some surgeons prefer the flexor carpi ulnaris (FCU), which possesses twice the tensile strength[6]. In addition to these tendons, both of which have a relatively short course, the flexor digitorum superficialis (FDS) is also an alternative. Regarding thumb restoration, transferring the palmaris longus (PL) to the rerouted extensor pollicis longus (EPL) is a frequent preference for providing abduction and extension[7], though abductor pollicis longus (APL) and extensor pollicis brevis (EPB) transfers are also viable considerations.

The aim of this study is to evaluate the clinical results of triple tendon transfer using the FCR for finger extension.

MATERIALS AND METHODS

This study retrospectively evaluated the results of tendon transfers performed for radial nerve palsy at our clinical center between January 2016 and December 2021. Nineteen patients (15 males, 4 females) who underwent triple tendon transfer using the FCR were included ethical approval was obtained from the Tekirdağ Namık Kemal University Non-Interventional Clinical Research Ethics Committee (approval number: E-46048792-050.01.04-350165, date: 22.09.2023).

A power analysis conducted via G*Power software, based on literature-derived effect sizes of 0.8 (Cohen), 80% power, and a 0.05 margin of error, indicated a minimum required sample size of n=15.

Surgical Technique

Under axillary anesthesia and tourniquet control, patients were placed in the supine position following standard surgical preparation and administration of 2 g of cefazolin prophylaxis. A longitudinal incision was made along the dorsal forearm. To restore wrist extension, the pronator teres (PT) was harvested with its periosteum from the radial attachment (Figure 1A), and tenorrhaphy to the extensor carpi radialis brevis (ECRB) tendon was performed using the Pulvertaft weave technique (Figure 1B).

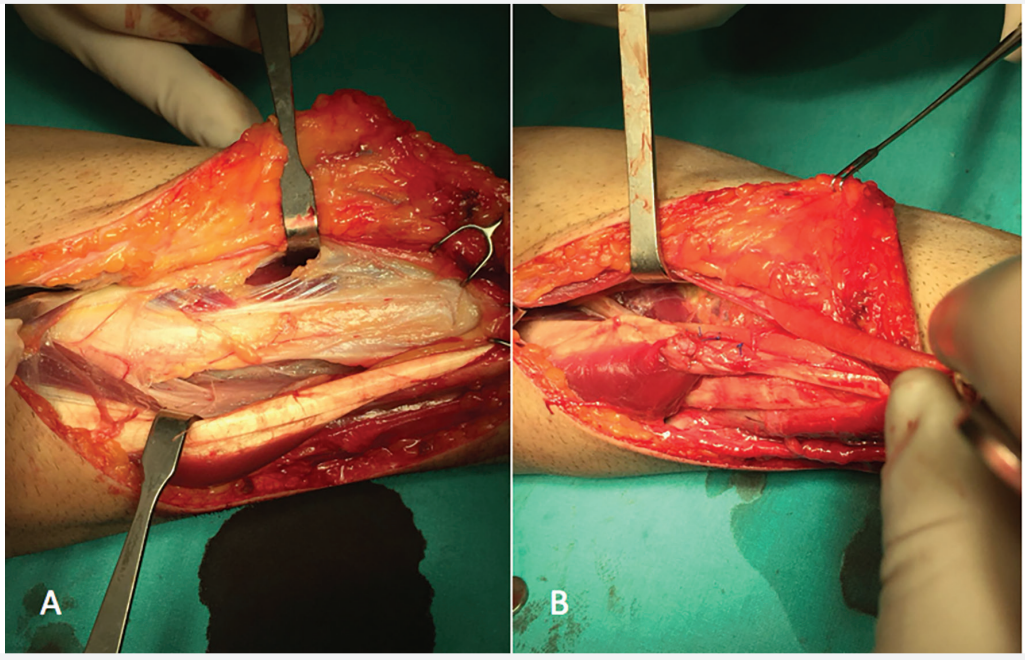

Figure 1. Pronator teres (PT) to extensor carpi radialis brevis (ECRB) tendon transfer. A) Harvesting of the PT with its periosteum from the radius B) PT-to-ECRB tendon transfer

Finger extension was restored by harvesting the FCR tendon at the wrist, which was then routed proximally and transferred to the extensor indicis proprius (EIP), extensor digitorum communis (EDC 2-5), and extensor digiti minimi (EDM) tendons via the Pulvertaft method (Figures 2A-C). For thumb extension, the EPL was rerouted volarly and transferred to the PL tendon (Figures 3A-C); in five patients where the PL was absent, the fourth FDS 4 was utilized as the donor (Figure 4). Skin closure was performed using 5/0 polyvinylidene fluoride sutures.

Postoperatively, a long-arm plaster splint was applied. Patients received wound care every two days, and sutures were removed during the second postoperative week. Controlled mobilization was initiated at four weeks, with full functional hand utilization permitted at two months. Follow-up examinations were conducted monthly for the first three months and quarterly thereafter for the first year. The mean follow-up duration was 32 months (range: 24 to 52 months).

Tendon transfers were evaluated using standard methods in patient follow-ups. Outcome measures included goniometric quantification of the range of motion in the MCP and interphalangeal joints, as well as wrist flexion, extension, and ulnar/radial deviation. Functional assessment was performed using Quick-DASH and Bincaz scoring systems preoperatively and at a minimum of two years post-treatment(Tables 1, 2)[8].

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics v26.0. The conformity of variables to normal distribution was examined using the Shapiro-Wilk method. Since the data did not show normal distribution and were in an ordinal categorical structure, the Wilcoxon signed-rank test was used to analyze the differences between preoperative and postoperative measurements. Descriptive data are presented as mean ± standard deviation for continuous variables and as number (n) and percentage (%) for categorical variables. The significance level was accepted as $p<0.05$.

RESULTS

Analysis of the demographic data for the 19 patients included in the study revealed a mean age of 34.53±15.13 years (range: 8 to 64 years). The majority of the sample consisted of male patients (78.9%, n=15), while female patients accounted for 21.1% (n=4). Regarding the distribution of the surgical site, a predominance of the left side (57.9%, n=11) was observed.

Two patients underwent surgery during the acute period, while 17 were operated on during the chronic period. The FDS of the ring finger was utilized in the five patients lacking a PL. Neurorrhaphy was performed in two cases: one involving a schwannoma and the other an acute stab wound. PT-to-ECRB transfer for wrist extension was omitted in three patients, two of whom presented with posterior interosseous nerve (PIN) lesions and one with nerve entrapment. All cases achieved

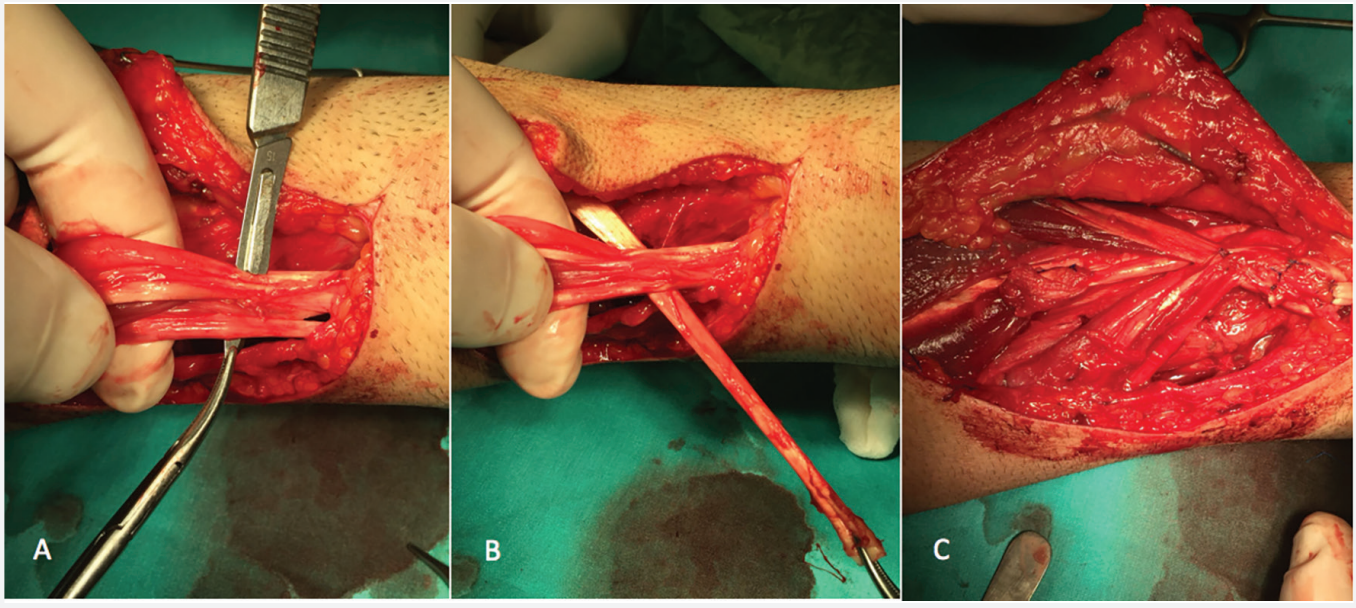

Figure 2. Flexor carpi radialis (FCR) transfer to the extensor digitorum communis (EDC 2-5), extensor indicis proprius, and extensor digiti minimi tendon transfer. A) Exposure of the finger extensors. B) Weaving of the FCR tendon through the finger extensors C) Final configuration using the Pulvertaft technique

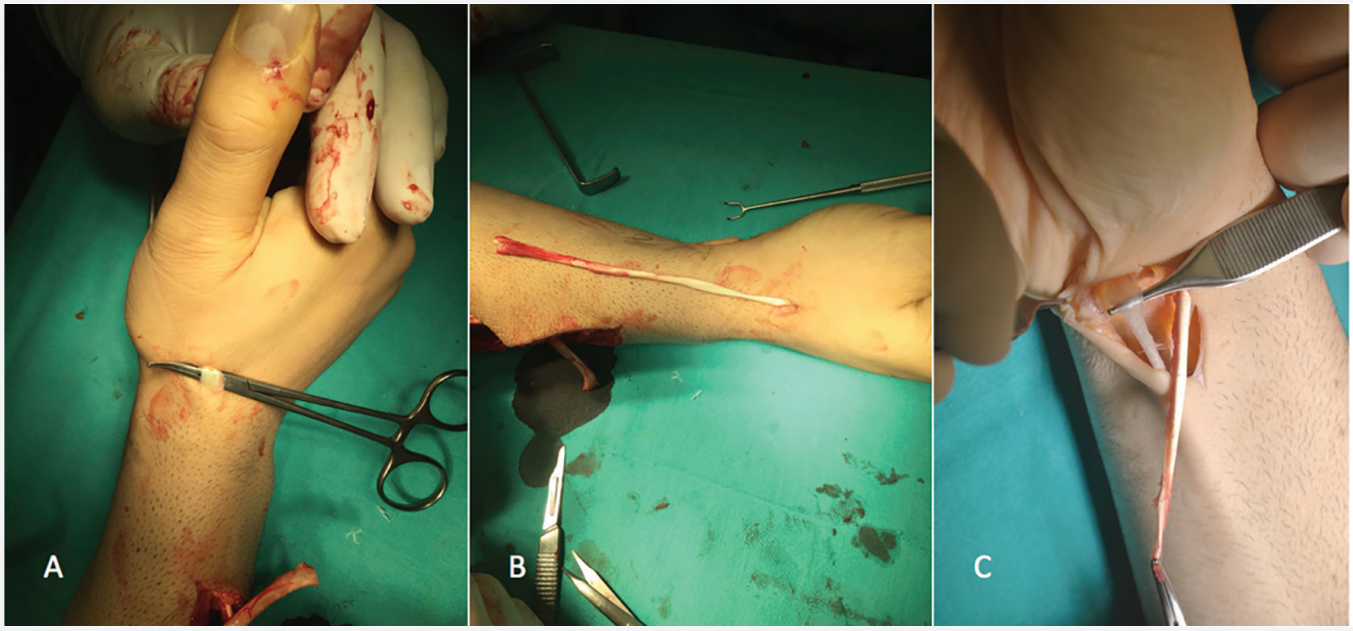

Figure 3. Palmaris longus to extensor pollicis longus (EPL) tendon transfer. A) Exposure of the EPL tendon B) Release of the EPL C) Volar rerouting of the EPL

Figure 4. Fourth flexor digitorum superficialis to extensor pollicis longus tendon transfer

Table 1. Bincaz criteria

Points	3	2	1	0
Wrist extension		0-29°	0-29°	<0°
MCP joint extension		Full	Loss <10°	Loss >10°
First web space opening		>39°	0-39°	<30°
Patient satisfaction	Excellent	Good	Fair	Bad

MCP: Metacarpophalangeal

Table 2. Bincaz scoring system

Outcome	Score
Excellent	≥8
Good	6-7
Fair	4-5
Poor	≤3

primary healing without wound complications. Detailed descriptive data are presented in Table 3.

Significant postoperative improvement was recorded in the Quick-DASH scores used to evaluate functional status ($p<0.001$). The mean functional loss score, which was 31.82 ± 14.82 in the preoperative period, regressed to 16.03 ± 7.97 postoperatively (Table 4). Results of the ordinal categorical analysis using Bincaz scoring demonstrate the categorical levels of functional recovery. This transition between preoperative and postoperative measurements was analyzed using the Wilcoxon signed-rank test, and the change was found to be statistically significant ($p<0.001$; Table 5).

Table 3. Patient characteristics and surgical procedures

ID	Age	Sex	Side	Type of injury	Neurorrhaphy	Status	Wrist extension	Finger extension	Thumb
1	54	M	Right	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP	EPL-PL
2	33	M	Left	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
3	15	M	Left	Forearm fracture (PIN lesion)	-	Chronic	-	FCR-EDC (2-5), EIP, EDM	EPL-PL
4	27	M	Right	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EDM	EPL-PL
5	39	M	Left	Firearm injury	-	Acute	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
6	34	M	Right	Soft tissue tumor	+	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-FDS4
7	44	M	Left	Forearm fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EDM	EPL-PL
8	31	F	Left	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
9	50	M	Left	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-FDS4
10	35	M	Right	Neural entrapment	-	Chronic	-	FCR-EDC (2-5), EIP, EDM	EPL-PL
11	23	F	Right	Schwannoma	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
12	29	M	Left	Stab injury	+	Acute	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
13	8	M	Left	Brachial plexus injury	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
14	64	F	Right	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-FDS4
15	20	M	Right	Stab injury	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-FDS4
16	31	M	Left	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
17	25	M	Left	Humeral shaft fracture	-	Chronic	PT-ECRB	FCR-EDC (2-5), EIP, EDM	EPL-PL
18	64	M	Right	Humeral shaft fracture	-	Chronic	PT-ECRL	FCR-EDC (2-5), EIP, EDM	EPL-PL
19	30	F	Left	Forearm fracture (PIN lesion)	-	Chronic	-	FCR-EDC (2-5), EIP, EDM	EPL-FDS4

PT: Pronator teres, ECRB: Extensor carpi radialis brevis, ECRL: Extensor carpi radialis longus, FCR: Flexor carpi radialis, EDC: Extensor digitorum communis, EIP: Extensor indicis proprius, EDM: Extensor digiti minimi, EPL: Extensor pollicis longus, PL: Palmaris longus, FDS4: Fourth flexor digitorum superficialis tendon, PIN: Posterior interosseous nerve

Table 4. Comparison of Quick-DASH scores

Measurement	Preoperative	Postoperative	p-value*
Quick-DASH score	31.82±14.82	16.03±7.97	0.001

*Wilcoxon signed-rank test, p<0.05 considered statistically significant

Table 5. Comparison of Bincaz functional scores

Bincaz score	Preoperative n (%)	Postoperative n (%)	p-value*
Poor	8 (47.1%)	0 (0%)	
Fair	5 (29.4%)	1 (5.3%)	
Good	4 (23.5%)	13 (68.4%)	0.001
Excellent	0 (0%)	5 (26.3%)	
Total	17* (100%)	19 (100%)	

*Wilcoxon signed-rank test, p<0.05 considered statistically significant

DISCUSSION

The results of our study indicate that triple tendon transfer utilizing the FCR for radial nerve lesions yields highly satisfactory functional outcomes. Radial nerve injuries typically result from direct cuts, trauma, or fractures. The incidence of radial nerve damage following humeral fractures is reported at 11.8%[9], establishing the radial nerve as the most frequently injured nerve associated with long bone fractures[7]. In our patient cohort, 63% of nerve injuries were attributable to fractures of the humerus or forearm.

Treatment options for radial nerve injury encompass two fundamental methodologies. The initial modality entails nerve repair, employing a range of techniques, namely primary, delayed primary, and secondary neurorrhaphy. Furthermore, in exceptional instances, neurolysis may be undertaken. Additionally, neuroplastic procedures, commonly employing sural nerve transplantation, are often utilized to rectify secondary nerve defects. The second methodology involves tendon transfer, a procedure specifically targeted at the forearm to restore lost functionality by redirecting and reattaching a muscle-tendon unit to another tendon or bone. Although treatments for radial nerve palsy have demonstrated successful results, there is currently no consensus regarding the most effective method or combination of treatments[6,10,11].

Tendon transfer planning after nerve repair can be determined according to Seddon's nerve regeneration rule (1-2 mm per day)[12]. Considering the expected recovery time, it is appropriate to apply tendon transfer after 12 weeks[10]. Other indications for which tendon transfer can be predicted include: severe injuries that cannot be repaired, late admissions exceeding 10 months, lack of electromyography response 6 months after nerve repair, severe atrophy/scarring, and high-level injuries such as brachial plexus lesions. In cases where the radial nerve defect exceeds 10 cm and primary repair or grafting is precluded by extensive

scar tissue, immediate tendon transfer should be considered a viable reconstructive strategy[13-15].

Tendon transfers to restore the radial nerve motor functions are basically evaluated in three main sections: wrist, thumb, and fingers[4]. While there is general consensus on the use of the PT as a motor muscle for wrist extension, it is also possible to use a variety of other muscles, such as the finger flexors, wrist flexors, and even the brachioradialis, with preservation of internal innervation[4]. To facilitate early recovery of grasp and eliminate the necessity of external splinting, an alternative approach known as "internal splinting", involving the early transfer from the PT to the ECRB during nerve repair, has been suggested. The process of radial nerve regeneration remains unimpeded by the implementation of this end-to-side transfer technique[15].

The posterior column of the thumb contains three muscles: APL, EPB, and EPL. Various options arise when planning a tendon transfer for the thumb[4,8]. Primarily, thumb column extension and retroposition are required, while avoiding radial deviation. The same transfer can be applied for the EDC and EPL. However, this alone limits the separation from the first commissure; thus, a separate tendon transfer for the APL and EPB can be performed to correct this[5]. We utilize a similar technique to that suggested by Scuderi, where the EPL is transferred to the PL, thereby preventing thumb adduction[4,16].

For finger extension, the FCU or FCR can be selected. One or more FDS tendons are also options. The FCU provides a force of 2 kg, which is close to the finger extensors; however, its excursion distance is 3.3 cm, which is less than the EDC excursion distance (4-5 cm). The FCR also has a shorter excursion distance than the EDC, yet its excursion distance is greater than that of the FCU, although it possesses a significantly lower force (0.8 kg)[4,8,17]. The use of FCU is controversial because it is the strongest flexor of the wrist; its absence can weaken wrist flexion and ulnar deviation while causing radial deviation[4]. In addition to aesthetic concerns, the grip strength decreases, affecting essential functions such as hammering and throwing.

Furthermore, the FCR can be obtained through a smaller incision, whereas the FCU requires an incision involving approximately two-thirds of the forearm[8]. While the FCR can be routed through the interosseous membrane, the FCU is transferred subcutaneously, which causes a visible bulge around the ulna[8]. In low-level radial nerve injuries, such as a PIN injury, the use of the FCU may result in severe radial deviation since the extensor carpi radialis longus (ECRL) is intact[5,18].

Brand et al.[17] and Tsuge and Adachi[19] described combinations of tendon transfers without the use of the FCU, suggesting PT to ECRB, FCR to EDC, and PL to EPL. We preferred FCR to EIP, EDC (2-5), and EDM transfer in our cases, and our results were sufficient according to Quick-DASH and Bincaz scores. Functional daily life requires 30° of extension, 5° of flexion, 10° of radial deviation, and 15° of ulnar deviation[11]; all cases met these criteria. No instances of weakness associated with radial or ulnar deviation were observed. According to the Bincaz scoring, five of 19 cases were excellent, 13 were good, and one was fair. Furthermore, the PL to EPL transfer provided favorable thumb abduction and prevented separation issues within the first commissure. We believe that the preservation of the FCU contributed to these positive functional scores. Supporting this, literature states that MCP joint range of motion is more important for grasp function than the strength of the transferred muscle[8].

Karabeg[10] evaluated the use of FCR and FCU in 40 cases with radial nerve injury following war-related injuries. The Zachary score was 92.25% in the FCR group and 82.20% in the FCU group ($p<0.05$). Tajima scores also favored the FCR group ($p=0.024$). This difference was attributed to better preservation of finger extension in the 2nd to 5th digits. In a comparative study by Kumar et al.[8], 10 patients achieved excellent or good results, three were fair, and two were poor according to Bincaz criteria. In three cases with high radial nerve palsy, radial deviation was attributed to adhesions between the ECRL and ECRB, suggesting routine intraoperative inspection. In cases where the FCU was used for finger extension, patients reported difficulty opening large jar lids and holding plates. Furthermore, due to limited ulnar deviation, difficulties were noted in performing the "dart-throwing motion," which is essential in certain professions.

This study demonstrates that favorable results are obtained by preferring FCR transfer for finger extension across various injury types. Since the majority of our patients utilize their hands for physically demanding tasks, we believe that the preservation of the FCU was effective in achieving high patient satisfaction.

Study Limitations

The limitations of the study include the relatively small sample size and the absence of a control group undergoing other transfers, such as FCU or FDS for the wrist.

CONCLUSION

Tendon transfers are a reliable method for restoring radial nerve motor functions, particularly in cases where the nerve is irreparable. Although a wide variety of tendon transfer techniques exist, every technique presents distinct advantages and disadvantages in practice. The surgeon must determine the specific technique on a case-by-case basis according to the patient's occupational and functional requirements.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the Tekirdağ Namık Kemal University Non-Interventional

Clinical Research Ethics Committee (approval number: E-46048792-050.01.04-350165, date: 22.09.2023).

Informed Consent: The study is a retrospective study.

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Fotnootes

Authorship Contributions

Surgical and Medical Practices: A.S., Concept: A.S., E.C., Design: A.S., E.C., Data Collection or Processing: A.S., E.C., Analysis or Interpretation: A.S., E.C., Literature Search: A.S., E.C., Writing: A.S., E.C.

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REFERENCES

1. Lowe JB 3rd, Sen SK, Mackinnon SE. Current approach to radial nerve paralysis. Plast Reconstr Surg. 2002;110:1099-113.
2. Latef TJ, Bilal M, Vetter M, Iwanaga J, Oskouian RJ, Tubbs RS. Injury of the radial nerve in the arm: a review. Cureus. 2018;10:e2199.
3. Moussavi AA, Saied A, Karbalaeikhani A. Outcome of tendon transfer for radial nerve paralysis: comparison of three methods. Indian J Orthop. 2011;45:558-62.
4. Tubiana R. Problems and solutions in palliative tendon transfer surgery for radial nerve palsy. Tech Hand Up Extrem Surg. 2002;6:104-13.
5. Tsuge K. Tendon transfers for radial nerve palsy. Aust N Z J Surg. 1980;50:267-72.
6. Besnard M, Marteau E, Laulan J, Bacle G. Tendon transfers for radial nerve palsy with extensor carpi ulnaris revival: technique and results. Orthop Traumatol Surg Res. 2020;106:307-10.
7. Shao YC, Harwood P, Grotz MR, Limb D, Giannoudis PV. Radial nerve palsy associated with fractures of the shaft of the humerus: a systematic review. J Bone Joint Surg Br. 2005;87:1647-52.
8. Kumar Vyas A, Gupta A, Patni P, Saini N, Lad PB. Evaluation of results of various tendon transfers in high and low radial nerve palsy. J Clin Orthop Trauma. 2020;11:614-9.
9. Korompilias AV, Lykissas MG, Kostas-Agnantis IP, Vekris MD, Soucacos PN, Beris AE. Approach to radial nerve palsy caused by humerus shaft fracture: is primary exploration necessary? Injury. 2013;44:323-6.
10. Karabeg R. Assessment of the forearm tendon transfer with irreparable radial nerve injuries caused by war projectiles. Med Arch. 2019;73:415-20.
11. Agarwal P, Kukrele R, Sharma D. Outcome of tendon transfer for radial nerve palsy using flexor carpi radialis combination (Brands transfer). J Clin Orthop Trauma. 2020;11:630-6.
12. Lee SK, Wolfe SW. Peripheral nerve injury and repair. J Am Acad Orthop Surg. 2000;8:243-52.
13. Omer GE Jr. The technique and timing of tendon transfers. Orthop Clin North Am. 1974;5:243-52.
14. Jones R. II. On suture of nerves, and alternative methods of treatment by transplantation of tendon. Br Med J. 1916;1:641-3.
15. Burkhalter WE. Early tendon transfer in upper extremity peripheral nerve injury. Clin Orthop Relat Res. 1974;104:68-79.
16. Scuderi C. Tendon transplants for irreparable radial nerve paralysis. Surg Gynecol Obstet. 1949;88:643-51.
17. Brand PW, Beach RB, Thompson DE. Relative tension and potential excursion of muscles in the forearm and hand. J Hand Surg Am. 1981;6:209-19.
18. Ingari JV, Green DP: Radial nerve palsy. In: Green DP, Wolfe SW, Hotchkiss RN, Pederson WC, Kozin SH (eds), Green's operative hand surgery (6th ed). Philadelphia: churchill livingstone Elsevier. 2011;1075-1092.
19. Tsuge K, Adachi N. Tendon transfer for extensor palsy of forearm. Hiroshima J Med Sci. 1969;18:219-32.